3.0 Event Factors and Analysis

The Board analyzed the facts, events, and conditions related to the Hanford Site's response to the 24 Command Wildland Fire. Because this event involved so many factors, the Board categorized them into specific topical areas for analysis. Change, barrier, and causal factor analyses were conducted for most topical areas. In addition, all topical areas were evaluated using the core functions of DOE's Integrated Safety Management System (ISMS). The factors analyzed and the Board's findings for each are documented in this section.

3.1 Firefighting

3.1.1 Hanford Site Fire History

Wildland fires occasionally occur on or near the Hanford Site; many result from lightning strikes. The readily available natural fuels (cheat grass, tumbleweeds, and shrub-steppe vegetation), coupled with the Columbia Basin area's ever-changing wind patterns, can produce wildland fires that may spread rapidly. Since 1984, the Site has experienced numerous small and three major wildland fires.

Typical lightning storm on Hanford Site (file photo)

In mid-August 1984, approximately 200,000 acres both on and off the Site were burned in a fire that expanded westward 20 miles during a 24-hour period. The 1984 fire started from a lightning strike on privately owned wildland west of Rattlesnake Mountain and south of Snively Canyon.

Another fire originated at the U.S. Army's Yakima Training Center in mid-August 1996. Over three days, it spread eastward into Benton County onto the ALE Reserve and crossed portions of SR 24. The fire, believed to have started from Army ordnance practice, burned approximately 90,000 acres on and off the Hanford Site.

In late July 1998, a lightning strike started a fire in the Elk Meadows area of the ALE Reserve. The fire burned approximately 7,000 acres before it was contained on the west side of SR 240.

3.1.2 Pre-Fire Planning and Hazards Mitigation

Hanford Site organizations have taken many steps to minimize the potential for, and consequences of, a fire on the Site. These include

- annual wildland fire planning

- development of the *600 Area Pre-Fire Plan*
- preplanned radiological controls for fighting fire in the BC Controlled Area
- maintenance of barriers and defensible spaces around Hanford facilities
- improvements in the control of deep rooted vegetation on radiological burial sites and cleanup of tumbleweeds near Hanford facilities
- emergency planning.

Wildland fire planning is conducted by the Site every year as part of the HFD's Annual Work Plan. The planning is initiated at the end of the winter season, and planning sessions are held until all actions are completed prior to the wildland fire season. The planning includes roundtable discussion and coordination between onsite heavy equipment operations, the FWS, Washington State Department of Transportation (WSDOT), Bonneville Power Administration, the HFD, and RL to ensure that the following actions are being completed:

- Fire department pumper units and grass units are maintained for the fire season.
- Annual wildland refresher training is provided to firefighters and heavy equipment operators.
- Chemical herbicides are sprayed near wooden power poles along SR 24, SR 240, and Resource Conservation and Recovery Act (RCRA) well sites.
- Air tanker support has been secured by agreement with the Central Washington Interagency Communications Center.
- Radio repeaters are available for an emergency, and master call lists are available for heavy equipment and meteorological data.
- Letters have been issued to contractor and other personnel on the Hanford Site restricting off-road travel.
- Fire danger signs are being updated.
- Natural fuel assessments are being completed.
- The *600 Area Pre-Fire Plan* is up-to-date.

Following the 1996 wildland fire, the pre-fire plan was reviewed closely by the RLs biological specialist, cultural asset specialist, and fire protection experts. The review concluded that the pre-fire plan needed updating to include cultural and biological asset and radiological dose considerations.

The reviews resulted in significant changes; the plan was updated in 1998 to include

1. addition of priority to protect historic, cultural, and biological resources using firefighting tactics that provide the least impact to the environment,

yet still maintain the first priority to protect human life and government facilities and property

2. evaluation of potential of radiological exposure to firefighters doing work in wildland areas posted for radiological control-Health physicists conducted two separate studies to determine the anticipated radiological hazards, potential doses to firefighters, and the appropriate level of personal protective equipment required to handle such hazards. This information, as well as plans to conduct surveys of personnel and equipment exposed to these areas, was included in the pre-fire plan.
3. call lists including FWS contacts and contacts for heavy equipment, cultural, archeological, and biological resources and subject matter specialists.

Aerial firefighting — helicopter operations

Since 1998, the *600 Area Pre-Fire Plan* has been reviewed and updated annually.

As a result of lessons learned from the 1984 Hanford range fire, firebreaks were cut each year between 1984 and 1995 by disking along the SR 24 and SR 240 rights-of-way. However, in 1995, the Benton County Clean Air Authority (BCCAA) received a fugitive dust complaint against blowing soil alleged from the disking of the firebreaks. RL formally responded to the BCCAA complaint in a 1995 letter stating that disking of firebreaks would be discontinued.

Instead of disking firebreaks along SR 24 and SR 240, Site personnel began to pre-burn vagrant tumbleweeds on the rights-of-way. However, legislative changes to the Washington State Clean Air Act in 1995 placed additional restrictions on open burning. BCCAA permits issued to the WSDOT to burn vegetation along state-controlled rights-of-way were limited to small acreage; further, only tumbleweeds could be burned. Consequently, the practice of burning along SR 24 and SR 240 was discontinued.

Firebreak

A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

1995 photos

Defensible Space

An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, "defensible space" is defined as an area a minimum of 30 feet around a structure and cleared of flammable brush or vegetation.

At the May 2000 pre-fire planning session, the HFD and WSDOT discussed burning tumbleweeds in limited areas along SR 24 and SR 240. However, in the wake of the Cerro Grande fire in New Mexico (where an escaped controlled burn threatened DOE facilities at Los Alamos National Laboratory), the DOE-HQ Office of Environment, Safety, and Health was considering issuing a formal moratorium on controlled burning on DOE sites. Those plans had been communicated informally to DOE-related fire departments and the DOE fire protection community as early as May 17. For this reason, the HFD advised the WSDOT to take no actions regarding controlled burns along SR 24 and SR 240. On June 5, the Deputy Secretary of Energy issued a memorandum declaring a moratorium on controlled burning at DOE facilities.

Hanford maintains barriers and defensible spaces around facility structures. Defensible spaces include green grass areas and concrete/asphalt/graveled areas clear of vegetation and other combustible materials. These defensible spaces provide a degree of fire hazard control per DOE's ISM process.

The Board concluded that each element of Hanford's pre-fire planning and hazards mitigation work played a positive role during the 24 Command Wildland Fire, resulting in minimal injuries, minor property damage, and limited radiological release.

However, the Board found that the lack of maintenance of defensible firebreaks along state highways allowed the fire to spread quickly onto the ALE Reserve. The Board concluded that RL, ORP, and the contractors need to engage and coordinate with local clean air authorities, state regulators, the DOE-HQ Office of Environmental Health (EH), and the WSDOT to evaluate the most effective means of establishing defensible space along state right-of-way shoulders between State Routes 24 and 240 and the DOE fenceline.

3.1.3 Agreements With Offsite Agencies

Agreements in place between the Hanford Site and offsite agencies have established protocols for interagency coordination and cooperation during situations of common concern or mutual interest.

The Tri-County Mutual Aid Agreement defines the arrangements for mutual aid established between and among fire districts and fire-related emergency service providers in Benton, Franklin, and Walla Walla counties. Specific parties to the agreement include the cities of Richland, Kennewick, Pasco, Prosser, and College Place; Benton County Emergency Services; Franklin County Emergency Management; and the fire protection districts of Benton County No. 1 through No. 6, Franklin County No. 3, Walla Walla County No. 4 and No. 5; and RL, which maintains the HFD.

A permit and memorandum of understanding (MOU) between RL and the FWS for the management of the ALE Reserve was developed in June 1997. The MOU specifies that until the FWS has developed its own approved management plan and upgraded its fire protection capabilities for the ALE Reserve, RL will provide fire protection, initial attack, and incident management for the Reserve on a cost-reimbursable basis from the FWS.

In September 1998, the FWS and HFD signed a cooperative agreement that provides more specific definitions of the fire protection and wildland fire suppression responsibilities of both parties. Included in this agreement is the list of Tri-County agencies participating in the mutual aid agreement. The agreement also specifies "light-on-the-land" firefighting tactics.

An agreement to obtain air tanker support from the CWICC for fixed-wing suppression has been in place since 1996 and was last revised during the week before the 24 Command fire.

A memorandum of understanding for mutual aid law enforcement assistance exists between RL, Adams County Sheriff's Office, Benton County Sheriff's Office, Franklin County Sheriff's Office, Grant County Sheriff's Office, Kennewick Police Department, Pasco Police Department, Richland Police Department, West Richland Police Department, and Tri-City detachment of the Washington State Patrol.

Although the foregoing agreements were in place during the 24 Command fire, some issues arose related to interagency coordination. First, helicopter support from the Yakima Training Center was used previously for fire suppression on the Hanford Site, but no formal MOU or agreement exists between Hanford and the Training Center to provide such support. A dispatch call was made to the Yakima Training Center in the early part of the fire for helicopter aerial suppression support. The Training Center initially approved the request. However, after two hours and several phone calls back to the Center to check the status of the helicopters, the Yakima Training Center denied the request because operations in progress at the Center required the helicopters there. A formal agreement for helicopter support with the Yakima Training Center could have alleviated confusion in requesting this resource.

24 Command Fire rages on

Light on the Land

The HFD and the FWS have agreed to "…..avoid the use of tractors, graders and other ground surface breaking/modifying equipment without prior approval of the FWS, except when the use of such equipment is essential to protect life, private property, or prevent the spread of fire to the Hanford Site east of State Route 240*…the final decision on the use of such equipment rests with the incident commander."*

The existing MOU between RL and the FWS contains out-of-date contact lists and no information about National Wildfire Coordination Group (NWCG) protocols. The agreement between the HFD and the FWS also does not discuss coordination using NWCG protocols for ordering aerial tanker suppression support. The Tri-County mutual aid agreement for fire protection does not address coordination using NWCG tools and interagency fire center resources.

Interagency Fire Center Resources

- National Wildfire Coordination Group - **The NWCG consists of a group of Federal agencies that develop formalized standards and protocols for training, qualifications, equipment, suppression priorities, and other functions for wildland fire suppression.**
- National Interagency Fire Center - **The NIFC uses the NWCG processes and standards in the actual deployment of fire and aviation resources for wildland firefighting. The NIFC's 11 geographical coordination centers provide regional fire suppression support.**
- Central Washington Interagency Communications Center - **The CWICC, operating under the Northwest Interagency Coordination Region of the NIFC, dispatched the aerial fire suppression support on the 24 Command fire. The NIFC also provided Type 2 and Type 1 resources during the 24 Command fire.**

The existing MOU for mutual law enforcement assistance does not discuss coordination with other on-scene emergency responders in a manner consistent with Hanford's incident command system. The parties to the MOU do not include the Yakima detachment of the Washington State Patrol, who controlled the accident scene on SR 24. The Washington State Patrol reopened portions of SR 24 while wildland firefighting operations still were ongoing along the highway. An MOU with the Washington State Patrol that incorporates the Hanford incident command system could have better assisted fire department emergency responders in the wildland fire operations so that roads would be reopened only with the agreement of the responsible incident commander for the wildland fire.

The Board concluded that prearranged coordination and understanding of the NWCG and the Hanford incident command system could have assisted the FWS, RL, the Washington State Patrol, mutual aid responders, and the HFD in managing the fire better. Prearranged coordination also could have enhanced RL management understanding of the role and responsibilities of the National Interagency Fire Center.

3.1.4 Hanford Fire Department Response

After receiving notification of the vehicle accident on SR 24, the HFD immediately dispatched initial units and personnel to the scene. While en route, the HFD made required notifications and requests for heavy equipment load-up, roadblocks from the Washington State Patrol, and tender tanker top-off.

First responders arrived on scene within 14 minutes of the initial call and provided an assessment of the accident and fire. The first responders cut the fencelines to the ALE Reserve, and arriving wildland firefighting apparatus immediately started the attack on the fire. Based on the initial assessment, the HFD Incident Commander (IC) requested additional resources and support, including two strike teams of wildland apparatus from the Tri-County Mutual Aid District, additional heavy equipment, and aerial fire suppression support through the CWICC. The HFD Incident Commander also requested that a Type 3 IMT be formed for this event. All HFD wildland firefighting apparatus were committed to this event and continued to support firefighting efforts on the ALE Reserve through June 28.

As the fire grew and approached the Hanford Site, the HFD chief initiated a plan to protect the central Hanford Site by cutting firebreaks along SR 240. HFD equipment and personnel were redeployed to protect Hanford nuclear facilities. Soon thereafter, the fire jumped SR 240 onto the central Hanford Site. The decision to redeploy HFD resources and protect the Hanford Site was timely and well reasoned.

The Board concluded that the HFD's initial response was prompt and that the IC structure continually adjusted, evolved, and planned ahead to manage the incident. The Board also noted that HFD personnel performed their emergency response duties with controls established through the DOE ISMS process. Because of that process, HFD personnel understand fire hazards, and the HFD had the appropriate equipment, personnel, training, and safety equipment to respond to this emergency. The HFD firefighters, incident commanders, and supporting personnel performed duties and responsibilities necessary to minimize consequences under the FWS agreement and on the Hanford Site.

3.1.5 Hanford Fire Department Needs Assessment

In 1996, the HFD completed a baseline needs assessment in accordance with DOE Order 420.1. Although DOE Order 420.1 has yet to be incorporated into any Hanford contract, the 1996 work was accomplished by way of a specific performance agreement for that year. Since then, critical fire department resources identified by the needs assessment document have been maintained.

Needs Assessment

DOE Order 420.1, *Facility Safety*, requires completion of a baseline needs assessment establishing the minimum required capabilities of Hanford Site firefighting forces. The needs assessment is a planning tool to ensure that appropriate resources (in accordance with DOE requirements) are provided for fire and related emergency needs. These resources include staffing levels, apparatus, facilities, equipment, training, fire pre-plans, offsite assistance requirements, and procedures.

The baseline needs assessment is an ISMS-based process that provides a method for analyzing hazards requiring HFD emergency response functions. The needs assessment results in the development and implementation of fire department-related emergency response resources necessary to control and mitigate associated emergencies.

The 24 Command Wildland Fire demonstrated a weakness in the needs assessment that had not been recognized before. When the Incident Command was transferred to the Type 3 IMT at around midnight on June 27, requirements of the National Wildfire Coordinating Group (NWCG) took precedence over local and Site processes. The HFD needs assessment does not consider NWCG requirements, nor does it provide for the necessary planning and training required to integrate the HFD into NWCG firefighting operations. However, HFD personnel training and qualifications meet NWCG standards.

Although adequate resources were obtained to manage this fire, the needs assessment document underestimated the complexity of a fire the size of the 24 Command Wildland Fire and the requisite escalation to a NWCG format. While this was not a critical factor in managing this fire, the Hanford needs assessment should address coordination with the National Interagency Fire Center using NWCG protocols and provide feedback into the Emergency Preparedness program. This would result in better wildland planning initiatives and better communications during similar events.

3.1.6 Offsite Responder Management and Deployment

In addition to the countless firefighting organizations, many offsite agencies provided support to Hanford during the Site Alert emergency. DOE requested the EPA to provide radiological monitoring. Personnel from the Washington State Department of Health (WDOH) served as onsite escorts to the EPA specialists. The DOE Nevada Operations Office supplied its specialized equipment for additional radiological monitoring. Through the CWICC, fixed-wing tankers and helicopters were supplied to support the firefighting operations.

On June 28, the Type 2 IMT had denied the use of offsite firefighters on the Hanford Site. This decision was based on circulated rumors that all Hanford vegetation is contaminated and could cause harm to responders. The HFD chief dispelled these rumors through extensive dialogue and by providing the Type 2 Incident Commander with a copy of an extant plan for managing offsite firefighting support in situations involving radioactive materials. The plan requires that specific training, which includes hazards communication, be provided before firefighters can be used on the Site. Further, the plan mandates that responding crews will not be used in known radiological zones or (in extreme cases) that a knowledgeable HFD firefighter will directly supervise crews entering these areas. The requisite training was provided to the offsite crews who did respond, and no offsite firefighter was used in a radiological zone.

The Board concluded that the HFD process for bringing offsite firefighters onto the Hanford Site is commendable. In contrast, a cohesive process is not in place for governing other offsite responders. Various elements of control are in place at Hanford and were exercised during this event (e.g., General

Employee Radiological Training for EPA personnel). However, those elements are not tied directly to the emergency response process and occurred in an ad hoc manner based on individuals' understandings of requirements.

The Board concluded that a management process parallel to HFD's approach needs to be applied to all offsite emergency responders.

3.1.7 Fire Barrier Analysis

Barriers are developed and integrated into a system to protect personnel and equipment from hazards such as fire. The Board evaluated specific fire protection barriers and how they performed during the event. The Board found that, overall, the system of barriers succeeded: the Hanford Site sustained limited physical damage, and the few injuries to Hanford personnel were only minor.

Fire near facilities in Hanford Site 200 Area

To identify lessons learned and conditions that could be improved, the Board assessed the performance of SR 24, SR 240, and Hanford Site structures as fire barriers. The specific successes and failures of each barrier are tabulated in Appendix C.

Change is anything that disturbs the "balance" of a system, keeping it from operating as planned. Change analysis examines planned or unplanned changes that cause undesired outcomes. For this event, a change analysis was performed to compare fire barrier successes (structures) with fire barrier failures (SR 24 and SR 240). The Board sought to identify any lessons learned or conditions that could be improved.

The detailed results of the barrier and change analyses are presented in Appendix C. These analysis results helped formulate the conclusions on which the Board based the judgments of need presented in Section 4.

3.2 Emergency Response

The Board's analysis of emergency response activities focused specifically on the planning, command, control, and communications aspects of the Site's response to the overall event resulting from the 24 Command Wildland Fire.

The Site emergency response was successful in dealing with the fire. The Board found that the emergency response programs for the Hanford Site meet general expectations. The Board also noted no significant adverse impacts

resulting from actions taken by emergency response personnel. However, the Board did find several areas in which performance could be improved.

First, the emergency response procedures did not always cover the exact situation confronting the responders. The Board's reviews indicated that no formal guidance was in place for handling some sitewide issues that emerged during this event—e.g., security of evacuated facilities, extended monitoring for public dose during an emergency, and recovery actions. In each case reviewed by the Board, Hanford Site staff developed and implemented appropriate responses, albeit on an ad hoc basis. Because the emergency response process is outside normal operations, procedures to be used during an emergency response must contain sufficient information to direct the emergency response personnel to do the right thing. In addition, they must be self-contained and stand-alone so emergency response personnel are not required to consult multiple documents.

Second, the Board noted no lapses in personnel manning emergency response positions. However, the Board did find that the emergency response organization lacked the defense in depth to support timely shift relief.

A third area for consideration is the designation of a Facility Representative for the overall Hanford Site. Such a representative would be located at the ICP during events involving multiple facilities on the Site.

3.2.1 Emergency Response Staffing Levels

Emergency Operations Center Staffing

Staffing of EOC positions is both mandatory and voluntary. Most EOC staff are on an "on-call" list, three deep per position. When the EOC is activated, everyone on the call list (three deep) is notified to report to the EOC. The first qualified individual to arrive staffs each EOC position. As others arrive, each position is expected to develop shift lengths and relief rotations. Currently, this process is not well established. Only three positions are designated as on call—the RL Emergency Manager, the ORP Emergency Manager, and the Site Emergency Director. No other position is formally on call. As a result, the potential exists for some positions required by the procedure to remain unfilled.

During the 24 Command fire, some EOC positions were filled with untrained personnel. These staff did, however, receive a short briefing before assuming the duties of their respective positions. The Board noted that the number of individuals to staff each EOC position was insufficient.

General Hanford Staffing

Outside the EOC, the overall Hanford Site has no formal process for staffing for emergency response activities and needs. Instead, supervisors call in staff

as needed. The Board noted the following specific examples of problems encountered in staffing for the emergency:

- Insufficient numbers of heavy equipment operators were available to work during the fire response. Consequently, those who were available worked 18- to 20-hour shifts to provide coverage. The lack of a driver at one point prevented a fire barrier from being fully constructed before the fire swept past.
- Radiological technicians initially were called in all at once. Too many responded to the call, and the surplus staff were released without establishing a schedule or providing for shift relief. On the next shift, everyone again was called in, and the surplus staff sent home. Eventually, some individuals did not respond to the call. The Board found no instances of lapse of coverage, but there was no consolidated process to transition into extended shift operations during sitewide emergencies for general Hanford staffing.
- The radiological response required the use of a mobile laboratory to provide real-time sample analysis. The individual trained on the specific, required equipment was not available. No backup had been trained to operate the equipment.
- Because most Site personnel had been released from work due to the emergency, only designated essential personnel were reporting to work stations. Contacting the released individuals with skills necessary to perform specific emergency response functions was difficult. The Site has no process for contacting personnel resources during an early release.

Fatigue

This event began on June 27, with the HFD, Hanford Patrol, and heavy equipment operators requisitioned from Site contractors generally manning the lines. The EOC was fully manned by 9 a.m. on June 28 and fully activated that same evening. The EOC remained manned and fully active through 5 p.m. on June 30; some positions continued to provide service through July 1. In the EOC, many individuals worked more than 12 hours, then slept for only 4 hours before working another long shift. For example, the aviation coordinator was on duty for 37 hours straight, 29 of which were spent in the EOC. In addition, the spokesperson for the Hanford Joint Information Center (JIC) was off duty for only 9.5 hours over a three-day period. Interviews indicated that some EOC staff and most heavy equipment operators had reached their limits of endurance and could not have kept up this level of performance.

Procedures in place at the HFD and the other responding fire companies require that personnel be cycled off-shift for rehabilitation periods. Through

this managed process, firefighting staff were rotated into positions of lower stress/less physical activity. The process also tracked total time on shift and monitored physical well being. This whole process was planned ahead of time. Even so, some firefighters worked longer than normal shifts because of the scope and complexity of the fire. With only 900 firefighters, the firelines were undermanned during the height of the effort, but only one case of fatigue was reported.

In contrast, for the rest of the Hanford Site, no provisions for secondary shifts were considered. The Board received reports of individuals who did not feel safe driving home due to fatigue after working long shifts.

The Board concluded that the staffing and scheduling of the emergency response personnel is not proceduralized sufficiently to support multiple-shift, protracted events. A process to manage hours to be worked during multiple-shift events must be developed and implemented across the Hanford Site.

3.2.2 Essential Personnel

Essential personnel were delayed in getting to the Site because Hanford Patrol staff at the checkpoints did not have up-to-date lists of Site personnel categorized as "essential." No process is in place to get this information to the checkpoints efficiently. The lack of up-to-date lists led to some confusion among facility staff members and required extra coordination and effort by the Hanford EOC and Hanford Patrol at checkpoints. Hanford Patrol staff were forced to make judgment calls as to who was essential.

Currently, the management of each Site facility identifies its essential personnel based on facility needs and forwards this information to the EOC and Hanford Patrol. However, this system is too labor-intensive to work efficiently during a sitewide event. The manager of the LIGO, a non-government tenant of the Site, was offsite when notified of the threat to his facility. He returned to the Site to place the facility in a safe condition. Access beyond a barricade was denied initially because his name was not on any list of essential personnel. Radiological monitoring teams returning to spell colleagues were delayed for similar reasons. Staff of Energy Northwest, another Site tenant, initially were unable to pass the manned barricades to get to work until special provision was made through the EOC to permit passage.

Because Site decisions affect non-Hanford systems on the Site, there is a pressing need to define the concept of "essential personnel" more fully. The Board concluded that the existing process for communicating essential personnel information did not work during this event.

3.2.3 Skilled Personnel

In general, Hanford does not have a process for using skilled personnel already onsite in dealing with sitewide emergencies. This relates to the core function of ISM of identifying scope, institutionalizing a needed process before an emergency exists. The Board recognizes that there is no way to have every expert for every situation report to the EOC or the ICP. However, a process is needed for providing skilled personnel quickly and efficiently when needed.

The Hanford EOC would have benefited from a subject matter expert (SME) in firefighting operations to assist in interpreting messages coming in from the ICP. Such an SME also would have understood the protocols of offsite agencies (e.g., the National Interagency Fire Center) for requesting and directing air tanker and other fire suppression support. The EOC's lack of understanding of these aspects did not affect the outcome of Hanford's response to the fire but did cause confusion in the EOC. The EOC also lacked an SME in aviation operations until a qualified individual voluntarily reported to the center and assumed the necessary role.

The emergency management system does not provide for a process to characterize the event for associated hazards, access technical support needed, procure needed resources, or reassess issues as the event changes.

Outside the EOC, specialized skills such as radiological control technicians (RCTs) and heavy equipment operators were needed. The RCTs were at the minimum number for the monitoring. If the event had expanded, more RCTs would have had to be called in. Heavy equipment operators were needed in large numbers. The number of operators available was sufficient for the two days they were needed. However, for a longer event, an offsite source of labor would be needed. The Hanford Site has no established process for gathering needed skills from Hanford Site resources.

In an emergency, the EOC has the authority to call in whatever resources are needed to handle the situation. However, preplanning to make use of existing Hanford resources, such as an SME specialized in the type of event taking place, is missing.

During protracted emergency events, there are times when available resources have been overextended and additional help is needed. Many times, personnel with general skills can be used to temporarily fill these positions or provide other secondary support. Consideration should be given within the emergency response process to incorporate this help in a structured fashion.

The Board concluded that the EOC did not get all the SMEs needed for efficient operations. The Board concluded also that a process does not exist for obtaining people with specialized skills from outside sources and internal volunteers.

3.2.4 Use of Offsite Personnel

Many offsite agencies provided support to Hanford during this sitewide emergency alert. This is in addition to numerous firefighters whose assistance to the Site was invaluable. As discussed in Section 2, the Type 2 IMT denied the use of outside firefighters on Hanford on June 28. This decision was based on circulated rumors that all Hanford vegetation is contaminated and could cause harm to responders. The HFD chief dispelled these rumors through extensive dialogue and providing the IMT with a copy of an exact plan for managing onsite fire support in situations involving radioactive materials. This process took about 6 hours and caused a delay in the deployment of these firefighting assets.

After the fire, information regarding potential airborne radioactivity was circulated among responders. Pilots who flew airdrops expressed concern that they were exposed to contamination from flying through the fire and smoke.

These examples illustrate how an established process to use offsite personnel could have been more efficient. The Board concluded that the process of using offsite personnel during emergency operations must be reviewed and revised.

3.3 Emergency Response for Non-Facility-Specific or Multi-Facility Events

The potential exists on the Hanford Site for multiple-facility/multiple-shift events. Some examples include range fires and radiological control events at one facility that pose problems at other areas. Currently, however, emphasis is given to addressing single-facility/single-shift events. As a result, during the 24 Command fire event, process problems surfaced in several areas: staffing the Hanford ICP, declaring the Alert emergency, releasing staff early, and preparing facilities to be abandoned.

3.3.1 Incident Command Post Staffing

Emergency Response Procedure RLEP 1.1, *Hanford Incident Command System and Event Recognition and Classification,* specifies certain roles and responsibilities within the ICP are assigned to facility personnel. The procedure does not address how these positions are filled during a non-facility-specific emergency or a multiple-facility emergency.

A facility's radiological control manager is assigned by procedure as the radiological hazards assessor and is responsible for coordinating radiological control functions throughout the incident scene. During the 24 Command Wildland Fire, it became apparent that an equivalent position had not been established to perform this function within the ICP for sitewide events.

Emergency response personnel within the Unified Dose Assessment Center (UDAC) responsible for dispatching field teams for plume tracking took on the additional function. They coordinated radiological control support to the ICP, dispatching RCTs to survey firefighters and their equipment. The UDAC field team coordinators were stressed to perform not only their assigned duties but also the duties of radiological control hazards assessor for the ICP. As a result, some normal safety functions were not performed:

- Not all teams received safety briefings before being dispatched.
- Some field teams were dispatched without reflective vests.
- Some RCTs were inadvertently worked double shifts because of odd turnover times and inadequate logkeeping.

When a single facility is involved in an emergency event, the Facility Representative reports to the ICP to act as liaison to the RL staff in the EOC. However, no procedure is in place to dispatch or employ a facility representative at the ICP during sitewide events.

The Board concluded that the existing emergency response procedures fail to identify how duties normally performed by facility staff at the ICP are accomplished when the emergency is not facility-specific.

3.3.2 Alert Level Declaration

On the morning of June 28, smoke from the fire began causing health problems for personnel in the 200 West Area. Approximately 18 individuals reported to health stations with complaints. The SED determined that it was prudent to remove personnel from the 200 West Area. Governing procedures call for an evacuation when an Alert level emergency is declared; procedurally, this happens only when a facility is threatened. For this reason, the SED issued an "early release" order for the 200 West Area based on smoke-related health issues, which is allowed by procedures.

"Early release" does not carry the urgency of an evacuation order, and some problems arose with personnel leaving in a timely manner. The plant manager at one facility consulted with his company management before he released his employees from work. This delayed their release from work for about 25 minutes. The employees thought that this delay was not warranted. The plant manager's understanding of the early release process was different from that of the employees. This caused confusion and concern and could have been avoided.

The Board considers the SED's call to release personnel early proactive and noteworthy. Additional health effects were minimized, a hasty evacuation was avoided, and the absence of personnel from the area provided more maneuverable space for firefighters and equipment. The Board concluded that the governing procedures inappropriately lack an avenue for evacuating facilities in a predictive and preventive manner.

3.3.3 Snively Canyon Fire - Anticipatory Alert Level Declaration

In August 1984 and again in June 2000, under extreme weather conditions, fires in Snively Canyon on the ALE Reserve became uncontrollable and burned significant portions of the Hanford Site. Fires breaching the canyon have reached Hanford structures and private lands, including residential and commercial areas, within 6 hours on massive fronts. Once the canyon has been lost, no natural features provide a barrier to fire. Only minimal manmade barriers, SR 240 and SR 255, block the fire's path. In both the 1984 and 2000 fires, neither barrier proved to be effective.

Snively Canyon

The second factor affecting fire severity is the terrain of Snively Canyon. The canyon is isolated, inaccessible in many places, and generally steep and rough overall. Soil conditions vary from hard basalt features to dust many feet deep with the consistency of fine flour. The unique geographical features of the terrain also form a "raceway" for fires to expand across the face of Rattlesnake Mountain. Local firefighters are aware of the canyon's significance and have discussed and practiced methods of containing fires in that area.

Hanford procedures do not cover anticipatory fires when considering emergency levels. There is insufficient time to mobilize state or national resources, once the fire escapes the Snively Canyon area. An Alert level emergency declared when fires are still contained in Snively Canyon would provide the Site additional time to marshal needed external resources to combat massive wildland fires, as experience has demonstrated will occur. One of the reasons the HFD performed so well in this emergency is that the department had almost two days to prepare for a fire on the Hanford Site. The flexibility to initiate an anticipatory alert can be created by adding a specific Emergency Action Level to the Hanford procedures based on a fire in Snively Canyon.

The Board concludes that a new Emergency Action Level should be written based on an anticipated fire in the Snively Canyon area of the ALE Reserve.

3.3.4 Preparation for Facility Abandonment

Emergency response procedures address evacuation of a building or facility for an emergency situation but do not cover abandonment of a facility. During an emergency, personnel move to a safe position around the facility and address the emergency. In abandonment, all personnel leave the area (e.g., go home) without knowing when they will be able to return. To abandon a facility or area, the systems must be placed in a safe mode and security issues addressed.

During the 24 Command fire event, the fire posed the danger of overrunning sections of the Site. As the fire approached facilities in the 200 West Area, and it appeared the facility personnel would be evacuated because of smoke, staff began preparing the facilities for abandonment. Their preparations were based on the plan they had developed. In some cases, no procedures were in place regarding how to prepare a facility for abandonment. It is to the credit of Hanford staff that the responsible personnel were able to formulate and execute the appropriate actions to protect the personnel, the facilities, and the contents of the facilities prior to abandonment.

Hanford Patrol personnel also took the necessary actions to prepare facilities at risk of being overrun by fire. They moved weapons and ammunition and installed tamper-indicating devices in sensitive locations. However, in several situations these actions were not prescribed by procedures.

Facilities abandoned because of the 24 Command fire were the LIGO, HAMMER, and Patrol Training Academy. Preparations for abandonment were made at the 200 West facilities.

Emergency response procedures address evacuation of a building or facility for an emergency situation but do not cover abandonment of a facility.

3.4 Emergency Response Communications

Communications are always an issue in emergency response. The Board found one communications failure issue and two issues with communications equipment.

3.4.1 Cellular Telephones

Emergency responders often use cellular telephones as an additional mode of communication. This is particularly true when traditional landline systems are damaged or when radio systems may be affected by terrain, environmental conditions, or saturation of open channels. Although cellular phones were

used during this event, cellular phone channels were limited and occasionally became saturated, affecting numerous organizations and the public.

Reviews of the 1998 Picric Acid Event had identified an issue related to the saturation of the cellular phone system channels. The increased volume of communications during the 24 Command fire again taxed existing cellular phone channels. In the event of communications systems failure or overload, the existence of adequate backup communications is critical. The Board concluded that cellular telephones should not be considered as a reliable system for communication during emergencies.

3.4.2 Hanford Fire Department Hand-Held Radios

The hand-held radios used by the HFD do well in the traditional Site-oriented response activities involving organizations associated with the Tri-County Mutual Aid Agreement. However, these radios are not all field-programmable with the frequencies needed to communicate with personnel from agencies and air operations not normally associated with the Mutual Aid Agreement. The limited ability to communicate directly with personnel from cooperating organizations hindered response operations during the 24 Command Wildland Fire. The Board concluded that the HFD had difficulty communicating with personnel from organizations who are not part of the Tri-County Mutual Aid Agreement.

3.5 Emergency Response Equipment

The Board identified four issues with emergency response equipment that encompasses a diverse set of factors ranging from the design of the EOC to use of offsite equipment.

3.5.1 Emergency Operations Center Facilities

The fire generating this event created a large plume of smoke that drifted south and southeast across much of the Tri-Cities area. The primary EOC is in the basement of the Federal Building, a General Services Administration structure in downtown Richland. The heating, ventilating and air conditioning (HVAC) system within the Federal Building, although in a recirculation mode, drew smoke-filled air into the EOC, causing some staff to experience discomfort. The situation was resolved by taking manual control of the Federal Building HVAC system and cycling it on and off while monitoring conditions in the building. More importantly, the smoke was sufficient to potentially set off the activation system. The building's smoke detection system was therefore disabled to prevent the building's fire alarm system from activating and forcing evacuation of the EOC and flooding of the space from automatic fire protection devices. The decision to disable the system was done with forethought by a DOE manager, and fire-watches were manned.

However, no protocols or procedures for accomplishing this task exist currently for the Federal Building, and the action was taken due to necessity rather than planning.

An alternative EOC has been designated for RL operations. This alternative is located at 2420 Stevens Drive. The alternative facility was not considered a viable option during this event because it is closer to the Hanford Site and the fire was moving in its direction. Unplanned evacuation of the primary EOC would have forced a transitory response and disrupted logistical support for the event for an unforeseen period of time.

The two EOCs for the Hanford Site are housed in locations originally designed as office spaces. This fact leads to an operational vulnerability during an emergency response. The Hanford EOCs do not meet Federal Emergency Management Agency (FEMA) standards for Emergency Response Facilities. The expectation both internally and from the public is that the Hanford Site is prepared to deal with any Site emergency. Although the Board found no governing DOE requirement for the EOCs to meet FEMA standards, good practice would recommend review of this subject.

The Board concluded that the Hanford EOCs present potential operational vulnerabilities due to current design.

3.5.2 Availability of Maps

Maps in the Hanford Patrol Operation Center (POC), the UDAC, the EOC, and the JIC are hardcopy maps showing only the Hanford Site with varying levels of detail. No maps of the surrounding counties were available. The JIC was not able to show media representatives the location of the BC Controlled Area and crib, and the EOC could not track movement of the fire into Benton County. The Patrol did not have an up-to-date location of the fire throughout the event. The Site has very good cartographic capabilities, but the information was not available for emergency response. Throughout the event, the location of the fireline was not known to the EOC, POC, or facility personnel because of each entity's lack of mapping capability.

Precise information from the ICP on fireline location was difficult for the Hanford EOC to obtain for several reasons. First, the fire was moving very rapidly, and exact locations would have been very hard to keep updated. In addition, during most of the fire, the Type 3 and Type 2 IMTs reported to the Benton County EOC because they were in charge of the offsite firefighting efforts.

Reports from the field came in as "The fireline is about 3 miles north of Gate 106." No two groups used the same set of maps, so coordination with unfamiliar reference points was very difficult. During the interviews, many

people suggested the use of global positioning system devices along with a standardized set of maps to give exact locations of the event.

The Board concluded that available mapping resources for emergency response did not provide information that could be used to effectively fight the fire, provide Patrol response, or give understandable information to the public.

3.5.3 Use of Offsite Equipment

Equipment belonging to non-Hanford agencies was used during the 24 Command fire. Examples are aircraft for Site inspections and a tanker truck for water. Issues with the aircraft are covered in Section 3.6.7. The privately owned tanker truck was used by the HFD.

No emergency response procedures exist to streamline the bringing in of equipment from offsite to address an emergency. The Board concluded that the process for bringing in equipment from offsite for emergency response is not institutionalized.

3.5.4 Offer of Front-End Loader at Accident Scene

At the initial accident scene, a private citizen offered the use of a front-end loader to fight the fire. The HFD declined the use of this equipment. This interaction has caused much controversy.

The citizen who offered the equipment wanted to help. However, the HFD responder told the citizen that the fire was on the ALE Reserve and the use of equipment off the road was not allowed because of "light on the land" policies.

When interviewed, the HFD paramedic involved in this exchange indicated that he was motivated by need to respond to the immediate situation; i.e., a fatal accident with fires burning on both sides of the road, vehicle traffic backing up, and the overriding concern for the lives of the people on the road. To get the citizen to a safe place expediently and prevent him from doing something that may have required a rescue effort, the paramedic provided an explanation that offered no opening for rebuttal. The explanation achieved the desired results. The citizen did not use the equipment.

Refusal of private equipment to directly fight a fire is the standard policy of the HFD. In this situation, the citizen's training was unknown, the equipment was unknown, and use of the equipment on the fire was unsafe because of the prevailing fire conditions. In the heat of the moment, the paramedic opted to not take the time to explain the HFD policy and instead cut the conversation short.

The Board concluded that the refusal to use the offered equipment was correct, based upon the safety issues and fire conditions.

3.6 Operational Issues

The Board found six operational issues associated with the event. Overall, there were very few injuries, and the early release of Hanford workers prevented smoke-related health problems. The aviation issue is a mixture of not having institutionalized procedures ahead of time and the procedures not being understood. The remaining issues are specific command and control problems.

3.6.1 Hanford Patrol

On the evening of June 28, a Hanford Patrol officer was instructed to check Gate 106 to Rattlesnake Mountain. At this time, the fire was moving rapidly to the south. As the officer arrived at the road to Rattlesnake Mountain, he observed the fire cresting the rise to the north of his location. With the flame front advancing swiftly, he was required to travel rapidly along the only remaining escape route, toward Benton City and away from the Hanford Site. This officer effectively was cut off from the Site for the time required to drive a 30-mile roundabout route to return to the Site.

Throughout the 24 Command Wildland Fire, limited information on fire status was available in the POC. The POC has no capability for monitoring the fire status. A fixed map is available in the POC; however, no dynamic system other than reports from observers is in place to provide updated information. The Board concluded that a Hanford patrolman was sent into the path of the fire because the POC was not aware of the fire location.

3.6.2 Laser Interferometer Gravitational-Wave Observatory Evacuation

The LIGO is an independent scientific research facility on the Hanford Site, manned by a small staff. The memorandum of agreement between RL and LIGO provides for emergency notifications to be issued to LIGO staff via the Hanford Site's crash phone system.

Interviews with LIGO staff indicate that notification was received at approximately 7:00 p.m. on June 28. Most Hanford Site personnel already were offsite at that time. The LIGO manager drove back onto the Site to secure the facility. A local Boy Scout troop had arrived and was touring the LIGO with another LIGO staff member. The returning LIGO manager ensured that the tour group was evacuated. The Board concluded that the LIGO crash phone system did not provide emergency information in a timely manner and, as a result, emergency evacuation of the facility was not timely.

3.6.3 Traffic Control

Traffic on SR 24 was heavily backed up when the initial HFD responders arrived at the scene of the initiating accident. The accident blocked the

entire roadway, and wildland fires were burning on both sides of the road. An estimated 50 to 100 vehicles and numerous onlookers interfered with the firefighting mission. State Route 24 was not closed immediately, thereby increasing the hazard to both the public and responding emergency units. In addition, SR 24 was reopened after the accident scene was cleared. Reopening the route caused additional interference with emergency vehicles stationed at the Cold Creek Vineyard ICP.

Evacuation instructions from the EOC informed employees living in the Yakima area to use SR 24. However, that route was closed to traffic. Alternate routes south also were blocked by firefighting activities. The Board concluded that traffic control processes (both onsite and offsite) were not well coordinated.

3.6.4 Crowd Control

Law enforcement efforts to control spectators were hindered by the extent of the sitewide event. Although Hanford Patrol requested assistance from the Richland Police Department to man barricades and control spectators, the Richland Police Department also was heavily engaged and not available to assist. Hanford Patrol was instructed to take crowd control actions as necessary.

In addition, unknown persons approached firefighters along SR 240 at two separate locations. These groups waved instruments and claimed firefighters were exposed to radiation, causing anxiety among the firefighters. The Board concluded that crowd control was not well coordinated.

3.6.5 Recovery Preparation

By the fourth day of the event, with the fire largely under control and firefighters concentrating on maintaining firelines and mopping up hot spots, planning for recovery and re-entry actions was under way. However, guidance regarding recovery procedures was lacking. High-level personnel from RL and the major Hanford contractor organizations met to plan the recovery activities. As an outcome of this meeting, staff from Fluor Hanford, Inc., as the major Site contractor and the responsible contractor for emergency operations, took the lead in bringing together personnel representing all contractors onsite. Aside from a representative from one contractor organization, all personnel present were authorized to commit their organizations to planned courses of action. (Commitment from this organization was obtained after repeated cycles to contractor management for approval.)

The group of Hanford contractor representatives put a recovery and re-entry plan in place within 4 to 5 hours, and the organizations executed the plan within 30 hours. The plan involved inspection of all occupiable facilities

and return of those facilities to an operational state; inspection of utilities; radiation surveys of waste sites and roads; and attaining assurance that emergency response capability was back to near normal.

Hanford staff did a commendable job in meeting the challenges of planning and executing the transition from emergency operations to recovery. However, the Board concluded that institutionalizing the recovery planning process and extending emergency drills to adequately exercise the process and personnel would ease the transition from emergency activation levels to recovery and re-entry in future events.

3.6.6 Medical Response

The extent and number of reported health-related issues were very small for an event of this scope and magnitude. Most cases were related to effects of smoke inhalation and irritation. The Board concluded that the decision to release Hanford workers early for smoke-related issues rather than wait for a direct fire threat was prudent and potentially eliminated many more occurrences. In addition, the Board found commendable the proactive response of Site managers who reassigned staff with known respiratory conditions.

3.6.7 Aviation

The significant use of aviation assets to fight the 24 Command Wildland Fire culminated in the identification of two issues that need to be addressed expeditiously. These issues include significant confusion over the status and control of the closed air space over the Hanford Site during the event and inappropriate use of available aircraft by personnel.

Air operations in progress

According to DOE-0233, *Emergency Plan Implementing Procedure,* all requests for airspace closure (temporary flight restriction, or TFR) over Hanford are to be made by the Occurrence Notification Center. DOE-0233 also has a blanket statement to be provided to the FAA when requesting a TFR. In response to a TFR request, the FAA will close a discrete portion of the Hanford airspace. The language in DOE-0233 does not allow any subsequent updating or relocating of a TFR.

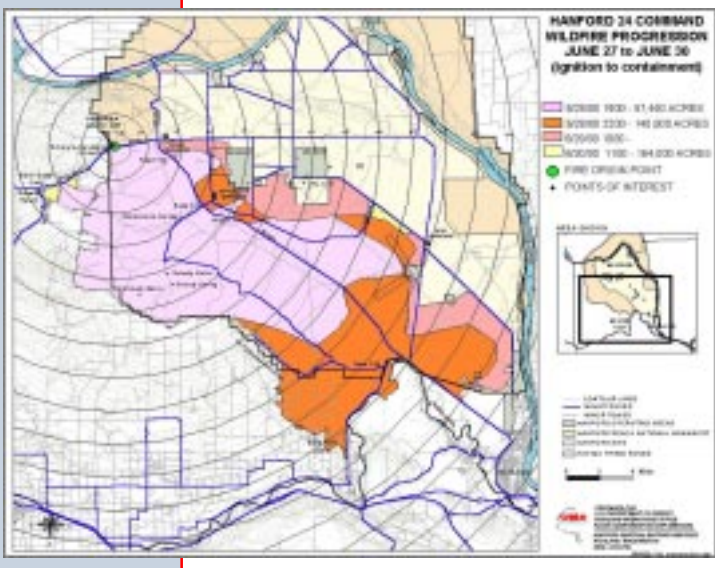
RL's Aviation Manual 440.2 requires aviation operations to be reviewed for certain requirements before any DOE-funded personnel ride on the aircraft. The manual has an emergency exemption clause, but it must be invoked by the RL Manager or Safeguards and Security Director before staff are allowed on aircraft not reviewed in accordance with the manual's requirements. No formally declared exemption was in place during the 24 Command Fire. However, discussions with the HFD staff revealed that flights were made to reconnoiter the fire with DOE-funded staff onboard. These flights were conducted outside the exemption process specified in Aviation Manual 440.2.

The Board concluded that planning for use of emergency aircraft during events such as the 24 Command fire was lacking. The Board concluded that the procedure for airspace closure did not contain flexibility to establish or move the TFR where needed, that the HFD procedures did not address establishing a TFR, and that Hanford personnel flew on chartered aircraft outside established procedures.

3.7 Radiological Control

The map in Figure 3-1 shows the areas on the Hanford Site that burned in the fire. No buildings containing radioactive materials were burned. Portions of the BC Controlled Area and a few underground radioactive material areas were burned over. However, major waste sites were protected and left undisturbed by the fire.

Good pre-fire planning resulted in protection of buildings, waste sites, and storage areas containing radioactive material. As an example, the fire swept through the ALE Reserve but the buildings containing low levels of radioactive material were protected from the fire as a result of the firebreaks and green belts established around the buildings. In contrast, a temporary trailer and a metal shed that did not contain radioactive material burned because they were not protected by firebreaks. A more detailed discussion of fire protection is contained in the barrier analysis in Appendix C.



Control of deep-rooted vegetation (e.g., tumbleweeds) on radioactive burial sites and heightened cleanup of tumbleweeds near facilities contributes to minimizing the release of radioactive material during a fire.

In 1998, Hanford identified an increase in the spread of contamination by biological vectors such as tumbleweeds. The Biological Control Program was centralized to improve its efficiency and effectiveness. The herbicide treatment effectiveness increased from 65% in 1998 to 90% in 2000. Sites where tumbleweeds are contaminated are being prioritized and cleaned.

Although the radiological impact of the 24 Command fire was low, the Board found several issues that need attention for improved response in the case of a more serious event.

Vegetation cleanup at Hanford

3.7.1 Communicating Hanford-Specific Radiological Hazards to Offsite Agencies

In preparing the *600 Area Pre-Fire Plan*, Hanford contractors had evaluated the potential radiological hazards of a fire in the soil contamination area known as the BC Controlled Area south of the 200 East Area. They identified the hazard as low. Personal protective equipment for radiological protection was not required. According to the pre-fire plan, only HFD firefighters would enter areas posted for radiological purposes.

The Benton County EOC timeline shows that offsite agencies were not aware of the low hazard or the preplanning performed by Hanford to minimize hazards to offsite firefighters participating in the response to a fire at Hanford. The Board concluded that Hanford-specific radiological hazards were not communicated adequately to offsite agencies prior to the 24 Command Wildland Fire.

3.7.2 Collecting and Analyzing Radiological Data

During a potential radiological emergency, the first priority of monitoring is to identify airborne radioactivity levels that require either onsite or offsite protective actions. This type of air sample is taken with a high-volume air sampler operated for a short duration. A second priority is obtaining high-volume, long-duration air samples to assess radiological dose to the public.

Effective Dose Equivalent

An annualized sum of the doses received by an individual from radiation sources both ingested or inhaled and external to the body.

The third priority is collection of environmental samples (e.g., soil and vegetation) to determine the extent of the release to the environment. In addition, radiological monitoring must be performed even when no release of radioactivity is expected, to demonstrate there was not a release.

During the 24 Command Wildland Fire, RL/ORP did not take any high-volume, long-duration air samples. To demonstrate that the dose to the public was below the limits of 10 millirem/year effective dose equivalent, RL/ORP prematurely collected the filters from some of the Site's low-volume, continuous air-monitoring environmental samplers, perturbing the Site's environmental monitoring program. The use of high-volume, long-duration air samplers during an event is preferable for greater sensitivity of the data, flexibility in placing the air samplers in the best location within the plume, and nonperturbation of the environmental monitoring program in order to obtain data more quickly.

A review of the emergency response procedures and interviews with RCTs indicated the following:

- The priorities for radiological monitoring are not formalized to include high-volume, long-duration air samples for assessing the low-level dose to the public.
- No RL/ORP Site emergency response procedures specify how or when to perform the airborne radioactivity, soil, and vegetation monitoring during and after an event.
- Training for RCTs does not cover performance of these specialized environmental radiological surveys.
- Use of laboratories for analysis of radiological samples was not preplanned to maximize efficiency to get results to the public as quickly as possible.
- The procedures did not provide for collection of negative data to confirm no release of airborne radioactivity when it is not expected.

In practice, the value of negative data was understood during the 24 Command Wildland Fire, and field teams were dispatched even before areas of known radioactivity (e.g., the BC Controlled Area) had burned.

The Board concluded that the process for collection and analysis of radiological data during and after the event was not formalized, resulting in inefficiencies and in the perturbation of the environmental monitoring program to obtain data for dose assessment to the public.

3.7.3 Continuing Recovery Action Process Beyond Facility Reentry

RL emergency response procedures specify that the UDAC will continue to be responsible for onsite radiological monitoring. However, the procedures did not include plans for how that responsibility is fulfilled. In addition, the

procedures in the *Onsite Recovery Plan — June 2000 Fire* (July 1, 2000) provided no guidance for developing a plan of action for continuing the operations at the UDAC to perform radiological monitoring, data collection, and analysis, and for coordinating data results with the Washington State Department of Health and EPA. Although not institutionalized, a Site team successfully performed the necessary activities. The Board concluded that processes need to be formalized for 1) continued operation of the UDAC after a Site event is terminated; 2) continuing radiological monitoring after the source of airborne radioactivity has been stopped; and, 3) coordinating and analyzing the radiological monitoring data.

3.7.4 Communicating Radiological Information

Technical Accuracy of News Releases

Some press releases issued by the Hanford JIC during the fire contained inaccuracies and incomplete information.

For example, before high-volume air sampling and laboratory analysis of samples were completed, several press releases incorrectly implied there was no release of airborne radioactivity. Later, as the analytical results of large-volume air samples became available, RL announced the potential release of airborne radioactivity. These press releases stated that ongoing monitoring during the fire had found no evidence of radioactivity above background levels. The initial lower-volume air samples were used to determine if any protective actions would be required for radiological protection of the workers and public during the emergency.

Incomplete information regarding the status of the BC cribs near the 200 West Area resulted in a press release stating that the vegetation over the cribs had been burned when it had not burned.

During a press conference, a statement was made that the fire barriers existed around Hanford facilities because combustible debris had recently been cleared from around the facilities. A more accurate explanation would have been that Hanford facilities are safe from the effects of fires by the Site's use of noncombustible construction materials including roofing and fire barriers from natural vegetation, concrete, asphalt, gravel, and green grass around buildings.

A review of EOC logs, records of news releases, and interviews with individuals responsible for the technical accuracy of the news releases revealed that no records were maintained relative to prepublication review and approval of the news releases. In addition, individuals reviewing the news releases did not ensure that appropriate terminology was used or that the news releases accurately reflected what the available radiological monitoring data meant in terms of health and safety of workers and the public. Inter-

views with the Site Management Team Emergency Preparedness Advisor responsible for the technical accuracy of these news releases revealed the contractor technical support in the EOC was not consulted for approval of the technical information. Actions normally taken during a facility event, such as the event contractor's technical review of information on the facility, were not performed.

Communication of Radiological Information within the Emergency Operations Center

There were no visual displays in the EOC relating field team locations and radiological monitoring data results. The computer system used previously to display plume projections and monitoring results was expensive and was not Y2K compliant. The Site deleted the system but never replaced it with another system. DOE personnel went directly to the UDAC to obtain radiological data, bypassing normal communications protocol and distracting UDAC personnel from performing their functions. The Board concluded the lack of tools for visual display of radiological information within the EOC contributed to ineffective communication of radiological data.

Communication of Radiological Data via the Internet

During the 24 Command fire, RL established an Internet site for posting radiological data. Although the intent is commendable, the information on the Internet site was not complete and was not kept updated. The misinformation caused public concern that Hanford officials were not being completely forthright with their radiological information.

No institutionalized process was in place to have an Internet site for radiological information during an emergency response. Because no process was established for the Internet site, it was not kept up to date and there was no way to monitor whether the information posted was correct. Inventing a new process during an emergency response situation is risky because the normal checks and balances for process implementation are not in place. No one has practiced the new process, so mistakes will be made. This goes against principles of ISMS and sound conduct of operations.

The Board concluded that the process of using an Internet site for posting radiological data has not been institutionalized.

3.7.5 Equipment

Radiological Monitoring Equipment for Field Teams

Field team radiological monitoring is designed to identify radiological conditions that would warrant protective actions for Site workers and the public.

Delays in hazards identification could adversely affect the timeliness of implementation of protective actions.

Following an event at the Plutonium Reclamation Facility in May 1997, Fluor Daniel Hanford recommended that RL's Office of Environment, Safety and Health upgrade two additional vehicles at the Federal Building for mobile field monitoring. These vehicles would be fitted for use in plume-tracking activities in case of a back-shift radiological event or other event where access to vehicles staged in the 200 Area is compromised. This recommended action never was completed. More than 4 hours were required to deploy the first radiological field team because team members had to retrieve vehicles from the 200 Area (a fire-threatened area).

In addition, the room in the EOC where radiological equipment is stored for emergency use for RL field teams was not maintained in a condition for ready access to the emergency equipment. Interviews with the RCTs responsible for field team monitoring indicated that equipment access was blocked. One technician indicated it took about an hour to move materials out of the way to gain access to the emergency equipment.

However, these conditions had no adverse impact on the radiological monitoring for this event. The field teams were deployed well in advance of the fire, reaching the soil contamination areas that were burned over in the fire.

The Board concluded that deployment of radiological monitoring field teams was delayed due to failure to stage vehicles for plume tracking at the Federal Building and because radiological equipment was not maintained in a condition for ready access.

Atmospheric Release Advisory Capability

During the 24 Command fire, the Atmospheric Release Advisory Capability (ARAC) system at Hanford would not print out the plume projection plots because of a software problem. Lawrence Livermore National Laboratory assisted RL in obtaining technical support from Las Vegas to troubleshoot and fix the software problem. The Board concluded the ARAC system at Hanford was not adequately maintained ready for use.

3.8 Emergency Response Asset Implementation

3.8.1 Federal Radiological Emergency Response Plan

During the 24 Command Wildland Fire, DOE-HQ, in conjunction with the White House and the RL Manager, determined that it was prudent to have the EPA perform independent radiological monitoring during the emergency response phase in addition to ongoing monitoring by Site personnel, which is outside the scope of the Federal Radiological Emergency Response Plan. The

The Federal Radiological Emergency Response Plan (FRERP) states "The objective of the .....FRERP is to establish an organized and integrated capacity for timely, coordinated response by Federal agencies to peacetime radiological emergencies….. The FRERP covers any peacetime radiological emergency that has actual, potential, or perceived radiological consequences…." The FRERP establishes a cooperative effort between Federal and state agencies to ensure that all Federal radiological assistance efforts fully support the objective to protect the public. The FRERP defines the roles of the different Federal agencies, including DOE and the EPA, during a radiological emergency. DOE is responsible to provide radiological monitoring and assessment activities during the emergency. The EPA is responsible for assisting DOE in monitoring radioactivity levels in the environment after the emergency condition has been stabilized. Federal agencies are trained to perform radiological monitoring in accordance with the FRERP.

EPA was not prepared to perform this new task. By the time the EPA was ready to perform airborne radioactivity monitoring, the fire was out. EPA specialists did provide air monitoring during a subsequent dust storm, which would identify if any re-suspension of radioactive material occurred. EPA monitoring results indicated that a small release of radioactive material had occurred at a level below the established limits of 10 millirem effective dose equivalent.

The Board concluded that the Secretary of Energy, White House, and RL Manager made a good decision in requesting EPA radiological monitoring during the 24 Command Wildland Fire to supplement monitoring done by Site personnel. In addition, opportunities for improvement in RL radiological monitoring were identified as a result of EPA interactions. However, the EPA was unable to perform radiological monitoring during the emergency phase because this new scope of work had not been adequately preplanned by all agencies involved.

Federal Radiological Monitoring and Assessment Center

One of the Federal assets available for use during a radiological emergency, the Federal Radiological Monitoring and Assessment Center (FRMAC) "...is established … for the coordination of Federal radiological monitoring and assessment activities with that of State and local agencies. The FRMAC is established at an on-scene location in coordination with State and local authorities and other Federal agencies." According to the FRERP, it is DOE's responsibility to establish the FRMAC. After the emergency is stabilized, the responsibility for continued operation of the FRMAC is transferred to the EPA.

3.8.2 Federal Radiological Monitoring and Assessment Center

Although the EPA was requested to provide radiological monitoring, the Federal Radiological Monitoring and Assessment Center (FRMAC), which coordinates Federal radiological monitoring and assessment activities with those of state and local agencies, was not deployed to Hanford to interface with the EPA monitoring teams. RL staff are not trained to function as a FRMAC.

The Board concluded that DOE did not comply with its responsibility to coordinate EPA radiological monitoring (through FRMAC) in accordance with the requirements of the FRERP. The poor coordination between DOE and the EPA contributed to the EPA's inability to perform radiological monitoring during the emergency phase. The Board concluded that formal MOUs between RL/ORP and the WDOH and EPA to coordinate Federal and state radiological monitoring could be used as an interim measure until the FRERP is modified.

3.8.3 Aerial Measuring System

Public information from the DOE-HQ Office of Emergency Response states that DOE is prepared to respond immediately to any radiological accident or incident in the world with its seven radiological emergency response assets. The "Overview of Federal Radiological Monitoring and Assessment Center Operations" specifies that aerial measuring system (AMS) assets are expected to be available within 4 to 8 hours.

The preferred aerial platform for performing a detailed aerial gamma radiation survey is a helicopter. The AMS-equipped helicopters are anywhere from six to fifty times more sensitive than the AMS-equipped airplanes. Discussions with personnel requesting assets at the Hanford EOC revealed that the AMS-equipped helicopters never were requested. Individuals within the Hanford EOC were not adequately familiar with this Federal asset and its capabilities.

Multispectral imagery equipment can be used to identify the location of thermal hot spots to support the firefighting efforts. The multispectral imagery equipment had been removed from the AMS aircraft (Cessna Citation), and the aircraft was reconfigured for personnel transport and was on standby at Lawrence Livermore. As a result, the multispectral imagery equipment was not available.

Nineteen hours after HQ Defense Programs offered the services of AMS, available assets were taking measurements at Hanford. However, preferred gamma monitoring equipment was not deployed. The sensitivity of AMS gamma radiation survey instruments deployed was too low to detect any plausible release from the soil contamination area that was burned. AMS assets to support firefighting efforts were unavailable. The Board concluded that, for the 24 Command Wildland Fire, AMS assets were not available for immediate deployment.

3.9 Lessons Learned

As part of this event investigation, the Board reviewed the lessons learned and associated corrective actions from previous fires and related events at the Hanford Site. The Board evaluated this information for applicability and

effectiveness relative to the 24 Command Wildland Fire. The lessons learned and corrective action management programs are part of the ISMS feedback process and are necessary for continuous improvement and to prevent unwanted occurrences.

The 1984 Hanford wildland fire was comparable to the 24 Command fire, with similar fire progression and burn areas due to the natural terrain and prevailing wind conditions. Over the past 16 years, much has changed at Hanford relative to emergency preparedness, communications technologies, Hanford security, and cooperation with external agencies. All of these changes represent a progression toward improved firefighting and emergency response capabilities. The final critique of the 1984 event identified many issues.

HAMMER training center looking north

Significant improvements have been made in the communications area due to technology advances, corrective actions from the 1984 fire, and proceduralized communications channels and requirements. However, two communication issues from the 1984 fire were not resolved and were observed during the 24 Command Wildland Fire:

- An excessive number of Hanford employees telephoned the Hanford POC to determine status of the fire and whether to report to work.
- Although technological advances have overcome issues identified in 1984 dealing with inadequate radio equipment, new challenges presented themselves during the 24 Command Wildland Fire. Specifically, cellular telephone communications were compromised, and radio communications with other agencies were hindered by limited frequency programming capabilities of HFD equipment.

Site access issues identified in 1984 concerned the definition of essential personnel and control of onlookers. Corrective actions were put in place after the 1984 event. However,

- The term *essential personnel* is defined inadequately. Corrective actions put in place after the 1984 event have degraded, and the process for defining essential personnel needs to be updated.

One firefighting strategy/prevention issue identified in 1984 was repeated during the 24 Command Wildland Fire:

- Firebreaks along roadways need improvement. Corrective actions were put in place after the 1984 event to establish and maintain firebreaks along roadways.

Substantial improvements have been made in the Emergency Preparedness program since the 1984 fire, including significant revisions resulting from the corrective actions identified from the Plutonium Reclamation Facility event. Of the identified issues, one remains:

- Maps and mapping capability in the Hanford EOC are inadequate for sitewide events.